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ON THE FOCUS OF POSTGLACIAL UPLIFT NORTH OF THE GREAT LAKES

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The first determination of the approximate location of the focus of postglacial uplift, based upon the amount of rise found in the beaches about Lake Ontario and Georgian Bay, appeared in a volume, to which access is difficult,[1] and for this reason the passage may be cited, as the revision to be given below will be found in general conformity with the previous conclusions.

> If the axis of maximum elevation for the various triangles about Lake Ontario and Georgian Bay be produced, they meet near latitude 51° N., and longitude 74½° W., a few miles west of Lake Mistassi and east of the southern end of James' Bay. Although mainly radiating from the focus, the axes of maximum elevation for the different triangles are not uniform, and are locally modified, as along the western side of Lake Ontario, where there is found a secondary axis of uplift to the east. Combining the more western axes with those of the eastern end of the lake, another focus of uplift appears near the "Height of Land" between Lake Ontario and Hudson Bay, in about latitude 48° N., and longitude 76° W. From the double foci it may be inferred that the uplift reached its maximum along a line joining the foci, or that the axis of maximum regional uplift was meridional and located along the eastern end of Lake Ontario, increasing in amount until near the "Height of Land," and thence with a diminishing ratio, or even depression, towards the north. . . . . At any rate, it is in the region southeast of Hudson Bay that the maximum differential elevation of the earth's crust, which involved the Iroquois beach, is to be found.[2]

Since that time (1889), Gilbert, De Geer, Taylor, and recently Goldthwaite have illustrated more or less fully the rise by isobars, which is only another mode of expressing the same phenomena, while Coleman has redetermined some of the triangles.

Combining additional measurements obtained from Fairchild and Goldthwaite, I have recalculated the mean rise in the various triangles from the present heights of the beaches about Lake

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[1] *Transactions of the Royal Society of Canada*, VII, sec. iv, 189, read May 5, 1889.

[2] J. W. Spencer, *ibid.*, 189.

Ontario and Georgian Bay, The postglacial bulge is like a sheet raised by an object thrust under it, the height increasing from outward from the focus of rise, but we can differentiate it in triangles

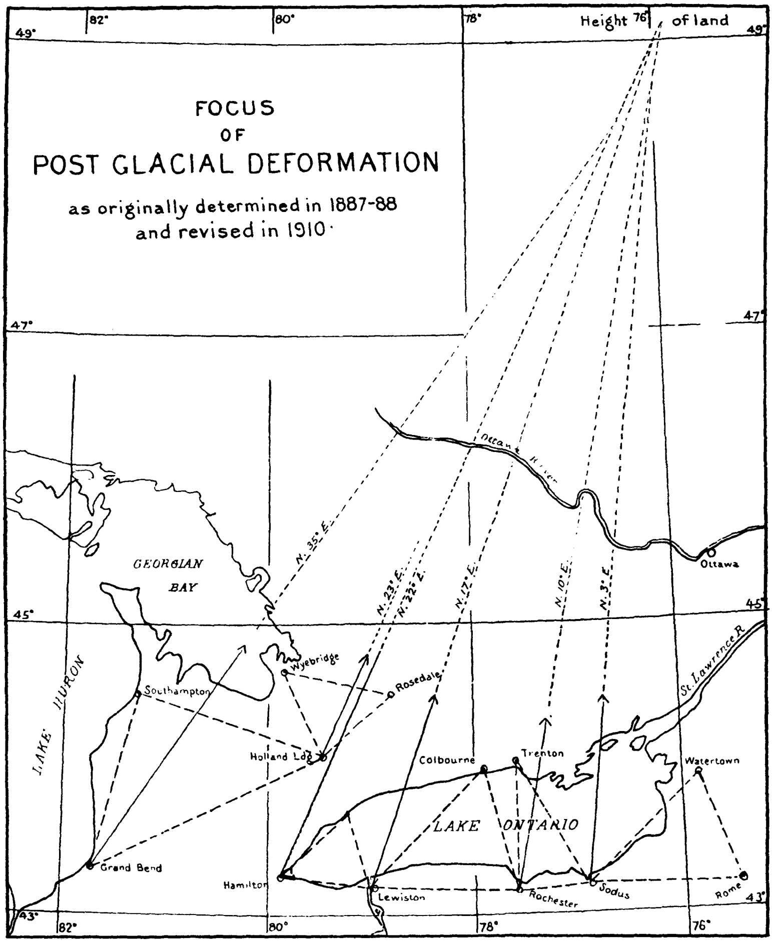

FIG. 1

and obtain the mean rate for each. These should cover the surveyed region, and be as nearly equilateral or right-angular as possible. Thus the following results have been obtained.

The mean rate of rise from the lowest points in the triangles and the direction, based upon the height of the Iroquois beach, cover the region of Lake Ontario.

Triangles between

Hamilton, Lewiston, and Scarboro,[1] 2 feet, N. 22° E.
Lewiston, Rochester, Colborne, Ont., 2.5 feet, N. 17° E.
Rochester, Sodus, Trenton, Ont., 3.6 feet, N. 10° E.
Sodus, Rome, east of Watertown, N.Y., 5.5 feet, N. 3° E.

These lines converge approximately in lat. N. 49° E., and long. 76° W. With the revised figures, the longitude is found to be the same, while the latitude is only 60 geographical miles north of the original determination, with the meridian of maximum uplift found to be just beyond the eastern end of Lake Ontario as originally computed.

Based upon the rise of the Algonquin beach east of Lake Huron, the mean rise in the triangles is found to be:

Between

Grand Bend, Southampton, and Rosedale, 1.3 feet per mile, N. 35° E.
Holland Landing, Wyebridge, and Rosedale, 3.4 feet per mile, N. 23° E.
Bradford, Owen Sound, Wyebridge, 3.1 feet, N. 27° E.

Combining the former of these triangles with those about Lake Ontario, the lines of rise from Grand Bend, and from Holland Landing, converge to the same point as those from Lake Ontario, but if the mean rate for the third triangle (which takes in a more western equivalent) be used the focus will be in about lat. 48° N.

Upham, Taylor, and Leverett have found the rate of rise in the region to the northwest to be of smaller amount, where Goldthwaite suggests that the rise also somewhat coincides with the height of land as found by me farther east in 1888, where the maximum amount is computed at some 250 miles north of Ottawa City, or a few miles to the west of this meridian.

The inferences to be drawn from these observations are: (1) that until a downward slope shall be found, we should conclude that the rise described continues to near the region indicated, beyond which the postglacial warping is downward; (2) that eastward of the 76th meridian, for any assumed latitude, the postglacial rise disappears and comes to be replaced by a downward slope. This is a question that has given the writer much solicitude, in an effort to determine the locus of downward warping in the

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[1] At a point 12 miles east of Toronto. If, in place of this, the elevation at Carlton (5 miles west of Toronto station) be taken, the line of rise is found to be N. 27° E.

field. As the higher beaches have been found by all of us to indicate the greatest amount of warping, we should not expect to find a great amount in the altitudes of the Champlain marine deposits, but we see these recurring at so many points to about 500 feet above sea-level, that, upon examining their locations in the St. Lawrence Valley, it is noticeable that they occur along segments of the circle, roughly speaking, with the radii converging to the vicinity of the focus found; while in receding toward Gaspé, New Brunswick, and Nova Scotia the marine deposits rise only to lower and lower altitudes. These data are well known, so that an undue demand on the reader's patience need not be made by their repetition here. So also with regard to most of the elevations on the Iroquois and Algonquin beaches. Again, the eastern equivalent of the warping of the Iroquois, south of Lake Ontario, and in the Mohawk Valley, supports the hypothesis of declining postglacial warping in that direction, after passing the eastern end of Lake Ontario.

The question of the location of the line of maximum postglacial elevation radiating from the region mentioned raises several points in physical geography; one of these being the explanation of the cause of the rise, as due to the disappearance of the glaciers, for this locality was hardly the center of glacial dispersion. This idea, however, is here thrown out for others to consider.

Since these notes were written, the admirable paper of Professor Goldthwaite on the "Isobases of the Algonquin and Iroquois Beaches" has appeared. While the treatment of the postglacial warping by isobasic lines is scarcely other than a different mode from determining the mean rise in the various triangles, yet each has a significance of its own. The isobases indicate a regional rise toward the Laurentian axis. The triangles carried this rise to the "Height of Land" and show the locus of maximum rise north of the Great Lakes.

Note on the Accompanying Map

The triangles about Lake Ontario are based on the instrumental measurements of the Iroquois beach, at the places on the map; those east of Lake Huron, on the measurements of the Algonquin beach. Height, at Rome and Sodus after Fairchild, of Holland Landing and Rosedale (in place of my Kirtvill) after Goldthwaite. The other points are from my own surveys.